

BACHELOR WITH BIOTECHNOLOGY AS MAJOR

5th SEMESTER

BTG 522J2: Animal Biotechnology

CREDITS: THEORY – 4, INTERNSHIP / PRACTICAL – 2

- **Course Learning Objective:** aim of this course is to acquaint students with animal cell culture, maintenance and applications.
- **Course outcome:** A student will be able to;
 - figure out different components of cell culture lab.
 - set up a cell line and perform different assays.
 - use cell culture technology for different applications.
 - employ modern techniques in animal biotechnology.

UNIT – 1 (15 HOURS)

Introduction to animal cell culture. Basic requirements for cell culture laboratory.

Sterilization techniques and maintenance of aseptic conditions. Overview of culture media: criteria for selecting media, physiochemical properties of media. Different types of media: natural, synthetic, and complete media. Serum and supplements, serum free media, commonly used media formulations with their specific uses, antibiotics and growth factors.

UNIT – 2 (15 HOURS)

Tissue disaggregation, primary and secondary cultures, suspension and adherent monolayer cultures, finite and continuous cell lines. Subculturing and maintenance of cell lines.

Commonly used cell lines and their sources (HeLa, HEK293, COS, HepG2, Breast MCF, neuroblastoma). Cell transformation, methods of cell transformation and properties of transformed & neoplastic cells. Cell immortalization. Cell viability and cytotoxicity assay (MTT, TUNNEL and dye based).

UNIT – 3 (15 HOURS)

Three Dimensional culturing: Examples of three dimensional cultures. Strategies and difficulties associated with 3D cell culturing. Organ and histotypic cultures: Introduction and differences, advantages and limitations, recent advances and applications. Vaccines: live, attenuated, subunit, genetic and modern day vaccines. Use of cell culture in vaccines, glycoproteins and hormone production. Stem cells: Introduction, culture of stem cells, applications.

UNIT – 4 (15 HOURS)

Introduction to transgenic animal technology: Strategies for the development of transgenic animals (retroviral vectors for insertion of DNA into embryo, microinjection into the enlarged sperm nucleus of a fertilized egg and introduction of engineered embryonic stem cells into an early-stage embryo). *In vitro* fertilization, artificial insemination and embryo transfer. Applications of transgenic animals and livestock, importance, scope of animal cloning and ethical concerns. Biopharming.

INTERNSHIP OR PRACTICALS (2 CREDITS: 30 hours)

1. Sterilization techniques: Glass ware sterilization and Laboratory sterilization.
2. Media preparation and its sterilization.
3. Isolation of lymphocytes from whole blood
(<https://vlab.amrita.edu/?sub=3&brch=69&sim=1422&cnt=1>)
4. Separation of serum from blood.
5. Cell viability assays (dye based).
6. DNA isolation from animal tissue.
7. Visit to animal cell culture/animal biotechnology lab.

BOOKS RECOMMENDED

1. R. Ian Freshney and Amanda Capes-Davis Freshney's Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications, Wiley-Blackwell
2. Butler, M., Animal cell culture and technology: The basics. II Edition. Bios scientific Publishers.
3. Glick, B.R. and Pasternak, J.J. Molecular biotechnology- Principles and applications, Taylor & Francis.